

IN THE CLAIMS:Listing of claims

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Claim 1: (Currently Amended) An image processing method comprising:
a determination step of determining a plurality of areas, each of which includes a plurality of pixels, arranged in a direction on an image;
~~a step of calculating a second order difference values from values each of which represents a different one of the plurality of areas; and~~
~~a representative value calculation step of calculating a representative value determined in regard of each of said plurality of areas, from a pixel value of each area;~~
~~a density gradient calculation step of calculating a value concerning a first order differential value from each combination of the two representative values in the representative values calculated in said representative value calculation step;~~
~~an evaluation step of calculating a value representing an irradiation end from each combination of the values concerning the first order differential value in the values concerning the first order differential value calculated in said density gradient calculating step; and~~
a judgment step of obtaining judging an end edge point of an irradiation area from the value representing the irradiation end calculated in said evaluation step second order difference values calculated in said calculation step.

Claim 2: (Currently Amended) A method according to Claim 1, further comprising a step of extracting the irradiation area from a plurality of end edge points obtained in said obtaining step.

Claim 3: (Previously Amended) A method according to Claim 1, wherein each of the values representing different one of the plurality of areas is an average value of pixel values in the corresponding area.

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Claim 4: (Previously Amended) A method according to Claim 1, wherein each of the values representing different one of the plurality of areas is a median value of pixel values in the corresponding area.

Claim 5: (Previously Amended) A method according to Claim 1, wherein each of the values representing different one of the plurality of areas is an average value of a limited number of pixel values in the corresponding area.

Claim 6: (Previously Amended) A method according to Claim 1, wherein each of the values representing different one of the plurality of areas is a median value of a limited number of pixel values in the corresponding area.

Claim 7: (Previously Amended) A method according to Claim 1, wherein each of the values representing different one of the plurality of areas is calculated by integrating pixel values in a direction in the corresponding area.

Claim 8: (Previously Amended) A method according to Claim 1, wherein each of the values representing different one of the plurality of areas is obtained by smoothing pixel values in the corresponding area.

Claim 9: (Currently Amended) An image processing method comprising:

a detecting step of detecting an end calculating candidates for edge points point of an irradiation area based on pixel values in an object area of an image from an image area; and

an evaluating step of evaluating a detection result in said detection step calculating an evaluation value for evaluating positional relations among coordinates of the candidates for the edge points of the irradiation area calculated in said detecting step or positional relations between a predetermined coordinate and the coordinates of the candidates for the edge points of the irradiation area; and

a judging step of judging whether an irradiation area is limited in the object area photographing is performed by an imaging device having an irradiation diaphragm function in a state of irradiation diaphragm or in a state of no irradiation diaphragm, based on an the evaluation value calculated result in said evaluation evaluating step.

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Claims 10-22: (Canceled)

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Claim 23: (Currently Amended) An image processing apparatus, comprising:
determination means for determining a plurality of areas, each of which includes a plurality of pixels, arranged in a direction on an image;
means for calculating second order difference values from values each of which represents a different one of the plurality of areas; and
representative value calculation means for calculating a representative value determined in regard of each of said plurality of areas, from a pixel value of each area;
density gradient calculation means for calculating a value concerning a first order differential value from each combination of the two representative values in the representative values calculated by said representative value calculation means;
evaluation means for calculating a value representing an irradiation end from each combination of the values concerning the first order differential value in the values concerning the first order differential value calculated by said density gradient calculating means; and
judgment means for obtaining judging an end edge point of an irradiation area from the value representing the irradiation end calculated by said evaluation means second order difference values calculated by said calculating means.

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Claim 24: (Currently Amended) An image processing apparatus comprising:
detecting means for detecting an end calculating candidates for edge points point of an irradiation area based on pixel values in an object area of an image from an image area;
evaluating means for evaluating a detection result by said detection means calculating an evaluation value for evaluating positional relations among coordinates of the candidates for the edge points of the irradiation area calculated by said detecting means or positional relations between a predetermined coordinate and the coordinates of the candidates for the edge points of the irradiation area; and

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judging means for judging whether an irradiation area is limited in the object area
photographing is performed by an imaging device having an irradiation diaphragm
function in a state of irradiation diaphragm or in a state of no irradiation diaphragm,
based on an the evaluation value calculated result by said evaluation evaluating means.

Claim 25: (Cancelled)

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Claim 26: (Currently Amended) A computer-readable storage medium storing a program for making a computer execute an image processing method, said method comprising:

a determination step of determining a plurality of areas, each of which includes a plurality of pixels, arranged in a direction on an image;

a step of calculating second order difference values from values each of which represents a different one of the plurality of areas; and

a representative value calculation step of calculating a representative value determined in regard of each of said plurality of areas, from a pixel value of each area;

a density gradient calculation step of calculating a value concerning a first order differential value from each combination of the two representative values in the representative values calculated in said representative value calculation step;

an evaluation step of calculating a value representing an irradiation end from each combination of the values concerning the first order differential value in the values concerning the first order differential value calculated in said density gradient calculating step; and

a judgment step of obtaining judging an end edge point of an irradiation area from the second order difference values calculated in said calculating step the value representing the irradiation end calculated in said evaluation step.

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Claim 27: (Currently Amended) A computer-readable storage medium storing a program for making a computer execute an image processing method, said method comprising:

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a detecting step of detecting an end calculating candidates for edge points point of an irradiation area based on pixel values in an object area of an image from an image area;

an evaluating a step of evaluating a detection result by said detection step calculating an evaluation value for evaluating positional relations among coordinates of the candidates for the edge points of the irradiation area calculated in said detecting step or positional relations between a predetermined coordinate and the coordinates of the candidates for the edge points of the irradiation area; and

a judging step of judging whether an irradiation area is limited in the object area photographing is performed by an imaging device having an irradiation diaphragm function in a state of irradiation diaphragm or in a state of no irradiation diaphragm based on an the evaluation value calculated result in said evaluation evaluating step.

Claim 28-31: (Canceled)

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Claim 32: (Previously Added) A method according to claim 9, wherein said detection step comprises:

a step of determining a plurality of areas, each of which including a plurality of pixels, arranged in a direction on an image;

a step of calculating second order difference values from values each of which represents different one of the plurality of areas; and

a step of obtaining an end point of an irradiation area from the second order difference values calculated in said calculation step.

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Claim 33: (Currently Amended) A method according to Claim 9, wherein in said evaluation step, variance of positions of end edge points detected in said detection step is calculated.

Claim 34 (Canceled)

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Claim 35 (Currently Amended) A method according to Claim 9, wherein in said evaluation step, whether positions of end edge points detected in said detection step are close to each other is evaluated.

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Claim 36 (Canceled)

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Claim 37 (Currently Amended) A method according to Claim 9, wherein said evaluation step comprises:

a step of comparing an average position of positions of end edge points detected in said detection step with a predetermined position.

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Claim 38 (Currently Amended) A method according to Claim 37, wherein said evaluation step further comprises:

a step of calculating variance of positions of end edge points detected in said detection step, in accordance with a comparison result in said comparison step.

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Claim 39 (Currently Amended) A method according to Claim 38, wherein in said obtaining step, the end edge point is obtained from the second order difference values and signs of first order difference values calculated from the values each of which represents different one of the plurality of areas.

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Claim 40 (Canceled)

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Claim 41 (New) A method according to Claim 1, wherein, in said evaluation step, a second order differential value is used as the value representing the irradiation end.